3/7/16 "Wisdom begins in wonder."-Socrates

HW: "Introduction to Functions" Homework page
Test 2 on Tuesday 3/15

AIM: What is a Function?

DEFINITION: A **function** is any "rule" that assigns exactly one output value (y-value) for each input value (x-value). These rules can be expressed in different ways, the most common being equations, graphs, and tables of values. We call the input variable **independent** and output variable **dependent**.

x y

***Exercise* #1:** An internet music service offers a plan whereby users pay a flat monthly fee of \$5 and can then download songs for 10 cents each.

(a) What are the independent and dependent variables in this scenario?

Independent: # of downloads

Dependent: Amount charged

(b) Fill in the table below for a variety of independent values:

Number of downloads, x	0	5	10	20
\$ Amount Charged, y	5.00	5.50	6.00	7.00

(c) Let the number of downloads be represented by the variable x and the amount charged in dollars be represented by the variable y, write an equation that models y as a function of x.

Monthly fee — cost per download.

$y = 5 + .10(x)$

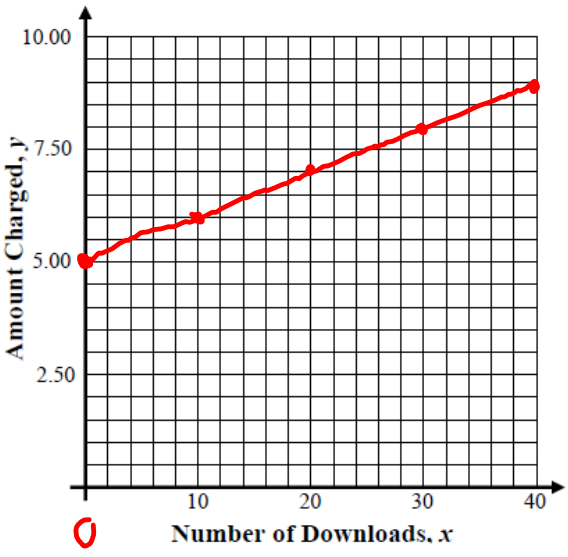
$y = .1x + 5$ ← linear

Slope = .1

y int = 5

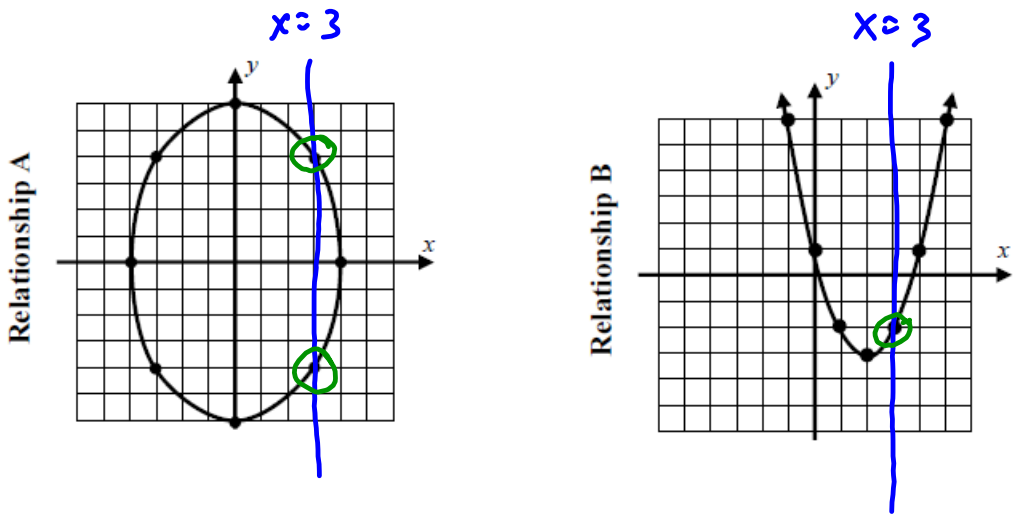
(d) Based on the equation you found in part (c), produce a graph of this function for all values of x on the interval $0 \le x \le 40$. Use a calculator **TABLE** to generate additional coordinate pairs to the ones you found in part (b).

x:	0	10	20	30	40
y:	5	6	7	8	9



Exercise #2: One of the following graphs shows a relationship where y is a function of x and one does not.

(a) Draw the vertical line whose equation is $x = 3$ on both graphs.



(b) Give all output values for each graph at an input of 3.

Relationship A: -4, 4

Relationship B: -2

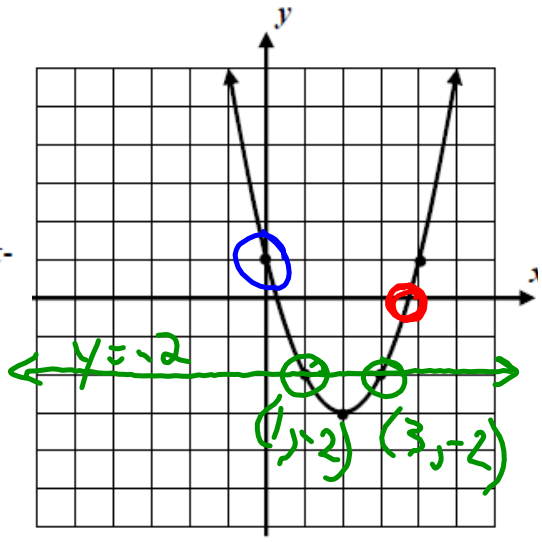
(c) Explain which of these relationships is a function and why.

Relationship B, there is only one output for every input.

Relationship B passes the Vertical Line Test.

VLT: any vertical line will hit a function at most once.

***Exercise* #3:** The graph of the function $y = x^2 - 4x + 1$ is shown below.



(a) State this function's y-intercept. (0,1)

x=0

(b) Between what two consecutive integers does the larger x-intercept lie?

Between 3 and 4

(c) Draw the horizontal line $y = -2$ on this graph.

(d) Using these two graphs, find all values of x that solve the equation below:

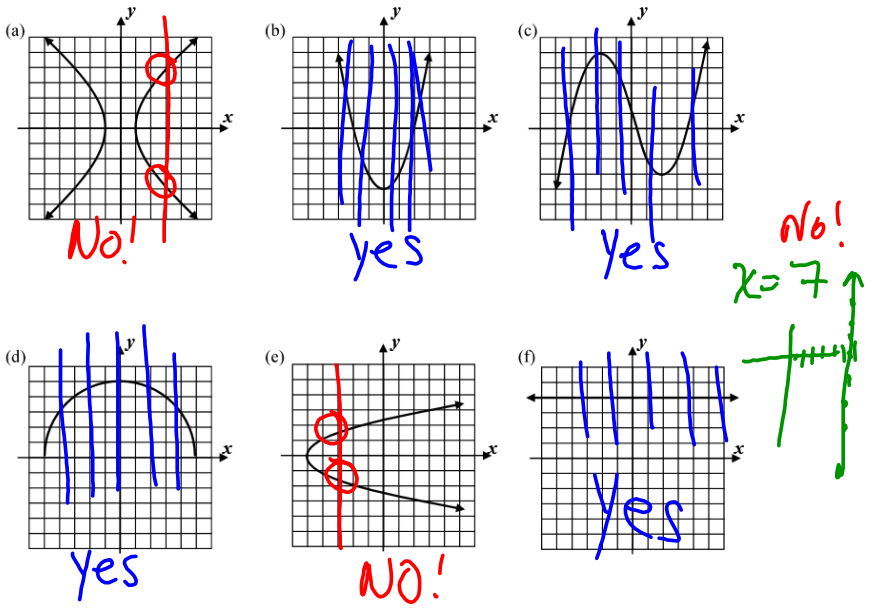
$$x^2 - 4x + 1 = -2$$

X = 1

X = 3

FLUENCY

1. Determine for each of the following graphed relationships whether y is a function of x using the Vertical Line Test.



2. What are the outputs for an input of $x = 5$ given functions defined by the following formulas:

(a) $y = 3x - 4$ (b) $y = 50 - 2x^2$ (c) $y = 2^x$

x=5

2a) $y = 3x - 4$

$y = 3(5) - 4$

$y = 15 - 4$

$y = 11$

x=5

2b) $y = 50 - 2x^2$

$y = 50 - 2(5)^2$

$y = 50 - 2(25)$

$y = 50 - 50$

$y = 0$

x=5

2c) $y = 2^x$

$y = 2^5$

$y = 32$

APPLICATIONS

3. Evin is walking home from the museum. She starts 38 blocks from home and walks 2 blocks each minute. Evin's distance from home is a function of the number of minutes she has been walking.

(a) Which variable is independent and which variable is dependent in this scenario?

time

distance

(b) Fill in the table below for a variety of time values.

Time, t, in minutes	0	1	5	10
Distance from home, D, in blocks	38	36	28	18

(c) Determine an equation relating the distance, D, that Evin is from home as a function of the number of minutes, t, that she has been walking.

$D = 38 - 2(t)$

(d) Determine the number of minutes, t, that it takes for Evin to reach home.

Distance is 0

$0 = 38 - 2t$

$+2t \quad +2t$

$\frac{2t}{2} = \frac{38}{2}$

$t = 19$

REASONING

4. In one of the following tables, the variable y is a function of the variable x. Explain which relationship is a function and why the other is not.

x	y
-2	11
0	7
2	11
4	23
6	43

Relationship #1

x	y
0	0
1	-1
1	1
4	-2
4	2

Relationship #2